1993 ANNUAL WATER MANAGEMENT PLAN
AND
1992 WATER CONDITIONS AND USAGE

LAKE ANDES NATIONAL WILDLIFE REFUGE COMPLEX
LAKE ANDES, SD

WATER UNIT: Lake Andes

I. Introduction

Lake Andes is a 4730 acre meandered lake whose water level depends entirely upon annual runoff. Two dikes cut the lake into three units, the North, Center, and South. Stop log water control structures are located within each dike; however, the lack of a permanent water supply precludes any water level manipulations.

Drainage area size and surface acres for each unit of Lake Andes are shown below. Maximum and average depth figures were determined in 1962.

Unit	Drainage Area Acres		Surface Acres of Water	Water Capacity (Acre Feet)	Depth/full Max	Avg
South	20,000	24%	1,760	16,159	13.5	11.5
Center	11,000	14%	2,359	18,000	14.5	12.9
North	53,000	62%	611	3,015	10.5	9.1
TOTAL	84,000	100%	4,730	37,174	--	--

In 1922, Congress passed a bill establishing a high water elevation of 1437.25 feet msl for Lake Andes via the construction of an artificial outlet on the South Unit. This level was established following local complaints about flooding around the lake. The Fish and Wildlife Service received the right to flood the meandered lake bed of Lake Andes in an easement taken in 1939 from the State of South Dakota.

II. 1992 Water Conditions

Total precipitation for 1992 was 24.30 inches, 2.93 inches above normal. The winter was mild and open with sporadic moderate snowfalls. There was little to no runoff from snowmelt. Water elevations dropped in all units during the summer due to high evaporation and percolation rates.

1992 Lake Andes Water Levels - Feet MSL

Date	North Unit	Center Unit	South Unit
05/15	1430.86	1429.49	1431.45
06/04	1430.60	1429.26	1431.30
07/01	1430.34	1429.10	1431.06
08/03	1430.75	1429.08	1431.10
09/02	1431.08	1429.06	1431.20
10/05	1430.90	1428.80	1430.90
11/02	1430.90	1428.80	1430.90
12/02	FREEZE-UP		

III. Ecological Effects

Lake Andes is currently in the lake marsh stage where only a few emergents remain around the outside. Since 1987 water levels have been falling. At that time all emergent stands of vegetation were drowned out. Lake Andes will probably remain in the lake marsh stage until a drought begins the cycle again.

Waterfowl breeding pairs totaled 283, up from 141 in 1991. Although an increase in pairs was observed, the lake is still extremely low and in its least productive portion of the marsh cycle. Much of this is due to increased turbidity from the presence of carp. There are few emergents to provide edge effect, brood and pair habitat, and cover for over-water nesting birds. Lake Andes does provide excellent roosting habitat for mallards and Canada geese during the spring-fall migratory periods.

No colonial nesting birds nested on Lake Andes in 1992. Prior to this, large numbers of black-crowned night herons, snowy egrets, cattle egrets, and great blue herons nested in flooded Russian olive trees in Johnson's Bay. However, water levels have receded and the main rookery is no longer flooded. In 1992, the birds did not return to this rookery.

The sport fishery in Lake Andes has been on the decline. Ninety-eight percent of the biomass now consists of bullheads which forage on young-of-the-year gamefish. This constant pressure has resulted in very poor gamefish recruitment.

Much of Lake Andes is vulnerable to fish winterkill. The North Unit froze to the bottom during the winter of 1992-93. Fish were unable to survive such an event as this. In addition, the Center Unit nearly froze to the bottom resulting in an extensive winter kill. The South Unit, although having nearly two to three feet of water below the ice surface did experience an extensive winterkill of fish too. Thousands of medium sized carp lined the lakeshore after ice-out.

IV. 1993 Water Management Objectives

Management objectives for 1993 are to contain as much runoff as possible in Lake Andes. Water in excess of the 1437.25 elevation mandated by Congress will continue to be released from the outlet on the South Unit.

WATER UNIT: Owens Bay

I. Introduction

The Owens Bay Unit is a 240 acre marsh unit separated by a dike from the South Unit of Lake Andes. A stop-log water control structure is located in the dike to allow water releases into Lake Andes.

Owens Bay, in addition to water from natural runoff, is maintained by a free flowing artesian well. The well, drilled in 1957, originally had a 1000 gpm flow and water right. Well shutdowns during the 1973 DVE outbreak resulted in casing destruction and new casing had to be installed. The new casing reduced the well opening from 12" to 8" and dropped the flow to approximately 450 gpm.

In 1986, Ducks Unlimited funded the drilling of a new 12" artesian well and the old well was capped. The new well has a 800-1000 gpm flow. The well distribution box and pipeline supplying the Prairie Ponds were also replaced. In 1987 the four water control structures on the prairie ponds were retrofitted with new screw gates for better water control.

II. Objectives

Owens Bay water management objectives are to store annual runoff and artesian well water to be used primarily as waterfowl habitat. Waterfowl production is the primary objective on Owens Bay. The emphasis is on providing excellent breeding pair habitat and permanent brood water. Secondary objectives include providing waterfowl migrational habitat and benefits for marsh and water birds, shorebirds, gulls, terns, and resident wildlife.

III. 1992 Water Conditions

The water elevation in Owen's Bay rose to 1439.30 feet msl and a depth of 3.0 feet in September following a period of heavy precipitation. This is below the full pool level of 1442.12.

The total precipitation for 1992 was 24.30 inches, 2.93 inches above normal. Low to moderate runoff due to snowmelt was

recorded. Artesian well water was used to continually supplement both Owens Bay and the prairie ponds. Although the artesian well has a 800-1000 gpm flow, it cannot completely offset water losses to evaporation and percolation. In addition to these water losses, we are losing a considerable amount of water to the South Unit via piping and seeping through existing dikes.

1992 Water Levels - Owens Bay

Date	Water Level
07/01	1439.20
08/03	1439.20
09/02	1438.30
10/05	1439.10
11/02	1439.40
12/02	freeze-up
Pool Bottom	1436.52
Full Pool Elevation	1442.12

IV. Ecological Effects of the Past Years Levels on Owens Bay

Pool levels remained low because of the lingering effects of drought and lack of runoff. The number of waterfowl pairs in 1992 was 117, up from 31 in 1991.

Pool levels have been stabalized at a low level by water from the artesian well which prevents the unit from going totally dry. Perimeter emergent vegetation increased in 1992 and should provide good brood habitat and cover for over-water nesting species should the water elevation increase.

V. 1993 Water Management Objectives

Water management activities for 1993 are to contain as much runoff as possible in Owens Bay. The artesian well will continue to run at full flow in order to offset as much annual evaporation as possible.

WATER UNIT: Broken Arrow Waterfowl Production Area

I. Introduction

The Broken Arrow WPA is a 2650 acre tract in Douglas and Charles Mix Counties, SD. Two drainage systems existed on the property when purchased. The Mud Lake Drain has an upstream watershed of 25,600 acres, while the second system, the Joubert Drain, has a 12,320 acre watershed. Five ditch plugs or low head dams, with concrete stop-log control structures, were installed in 1979 along the drainage ditches, two on the Mud Lake ditch and the remaining three on the Joubert drain. Dam #6 was constructed below dam #2 on the Mud Lake drain in 1984. Dam #7 on the Joubert Drain was constructed during the fall of 1986 in cooperation with Ducks Unlimited who funded the project design and construction. A water rights permit for the storage of 131.2 acre feet of water was granted by the South Dakota Department of Water and Natural Resources. The impoundment at capacity covers 56.4 surface acres. The development increased the quantity of pair habitat by creating 5.9 miles of shoreline. The maximum depth is 6.5 feet. Design specifications for the seven dams are as follows.

Embankment Volume YD^3	High Water Contour	Surface Acres	Acre-feet Impounded
Dam #1 - 76	Unk	6.2	5.7
Dam #2 - 755	Unk	27.9	82.6
Dam #3 - 2761	Unk	43.6	163.0
Dam #4 - 586	Unk	34.7	88.3
Dam #5 - 137	Unk	6.3	5.2
Dam #6 - 900	Unk	30.0	Not determined
Dam #7 - 5470	1526.0	56.4	131.2
	TOTAL	205.1	476.0

The capability to manipulate water levels is very limited on the Broken Arrow WPA. Impoundments can be drawn down as objectives dictate. However, to reflood depends on spring runoff and no capability to flood when desired is possible.

II. Objectives

The storage of annual runoff in impoundments is to be used primarily as waterfowl production habitat. The habitat provided also benefits marsh and water birds, shorebirds, gulls, terns, and raptorial birds. Secondary benefits are provided to resident wildlife and livestock used for management purposes. Water excess to storage needs is allowed to drain through the system.

III. 1992 Water Conditions

The winter of 1992-93 was relatively mild with moderate snowpack in the broken arrow drainage. Total precipitation is not monitored on site, however it was similar to that of Lake Andes NWR which was slightly above normal. As in 1991, impoundments 2 and 4 partially filled with water because they were upper most on their respective drainages. The other impoundments were virtually dry.

IV. Ecological Effects of the Past Years Water Levels on the Broken Arrow WPA

All impoundments have experienced excellent growth in the pool bottoms by annual weeds and hydric plant species. The vegetated pool bottoms now support greater numbers of ring-necked pheasants and white-tail deer. Numerous non-game birds have been attracted to the food source provided by seeds from the annual weeds.

V. 1993 Water Management Objectives

Water management objectives for 1993 are to contain as much spring runoff as possible in all pools.

Five water control structures have been retrofitted with new screw gates allowing more efficient water management. They replaced the non-functional stoplog-liftgate structures. This project is dependent on 1993 precipitation amounts.

WATER UNIT: Karl E. Mundt National Wildlife Refuge

The Karl E. Mundt NWR borders the Missouri River in Gregory County. The refuge was established in 1974 to protect habitat important to wintering bald eagles. The only water on the unit itself is four small (less than 1 acre) stock ponds that are used in conjunction with the grazing program. There is also a free-flowing artesian well that provides water for a small 1/2 acre pond.

There presently is no active management of water on the Karl E. Mundt Refuge.

WATER UNIT: Sherman Waterfowl Production Area
SD Water Permit No. 5251-3

This water permit is for sufficient runoff water annually to fill the Sherman WPA to elevation 1591.7 feet msl. The Sherman WPA is located in a portion of the W½ Section 3; E½NE¼ Section 9; NW¼NW¼ Section 10; all in T. 98 N., R. 66 W. The permit establishes first priority to 271 feet of an undivided interest in a total of 323 acre feet of water stored in a natural basin on both the Sherman WPA and private land at elevation 1591.7 feet msl. The water appropriated shall be used for the purpose of providing fish and wildlife habitat.

This basin was dry during 1992 except for a short period during June when rainfall collected in the basin. Small amouts of water did accumulate on parts of the unit after heavy rainfall events. However, the unit was dry by September. The private individual who holds a SD water permit to use water from his portion of the basin did not pump any water for irrigation.

WATER UNIT: Varilek Waterfowl Production Area
SD Water Permit No. 5250-3

This water permit is for sufficient runoff water annually to fill the Varilek WPA to elevation 1614.0 feet msl. The Varilek WPA is located in the E½ Section 11, T. 98 N., R. 66 W., Charles Mix County, SD. The permit establishes first priority to 139 acre feet of an undivided interest in a total of 190 acre feet of water stored in a natural basin both on the Varilek WPA and private land at elevation 1614 feet msl. The water appropriated is used for the purpose of providing fish and wildlife habitat.

This basin was virtually dry during all of 1992. The private individual who owns a portion of the basin did not exercise his right to water.